

## Introduction

- Health care delivery is dependent on the licensed professional nurse.
- the health of the nurse appears to be worse than the health of the average American (ANA, 2015; ANA & ICG, 2016; Carpenter & Dawson, 2018).
- The nursing population is experiencing:
  - Rates of obesity ranging 23%-61.4% (Keele, 2019).
  - Suicide rate: 18.5% (Davidson, et al., 2019)
  - Substance abuse at a rate of 20% (Ivey, 2015)
  - Depression at 18% prevalence compared to nation prevalence of 9% (Letvak et al., 2012)
  - Health care providers rank third among other occupations for experiencing major depressive disorder (Batalla et al., 2019)

## Background and Significance

- Lack of physical activity can contribute to poor self-care
- Low resiliency → Burnout (Press Ganey, 2018)
- Night shift nurses are vulnerable to poor health behaviors (Ross et al., 2017).
- The poor health behaviors of the nurse can impact the safety and quality of patient care (Bodenheimer et al., 2014; Dyrbye et al., 2017; Jordan et al., 2015; Jordan et al., 2016).
- Depression and poor health are linked to medical errors (Chesak et al., 2015; Melnyk et al., 2018)
- Medical errors are the third leading cause of death in the U.S. (Makary, 2016)

## Methodology

- Longitudinal non-experimental hybrid study.
- Population: 29 registered nurses at an academic affiliated 300 bed private hospital
- Gamified competition structure incorporating use of fitness trackers to collect steps and time spent exercising
- Participants used their own fitness trackers that were linked to Google Fit. Nurses were assigned to teams and competed in weekly competition. Winners were determined based on step totals and minutes spent exercising.

## Study occurred over 8.5 weeks in 4 phases:

- Recruitment phase**
  - Research council, advertisement
- Orientation phase**
  - Consent procedure
  - Google Fit accounts assigned
  - Demographic survey
  - Validated tools- PSS, PSQI, HPLP-II
- Competition phase**
  - Team formations (3 RNs per team, 11 teams total)
  - 4 nurses were disqualified mid-competition
  - Weekly competition
  - Weekly leaderboards
- Post-competition phase**
  - Repeated validated tools
  - Qualitative interview

Table 1

Ranks		N	Mean Rank	Sum of Ranks
E <sub>1</sub> - E <sub>2</sub>	Negative Ranks	12 <sup>a</sup>	14.29	171.50
	Positive Ranks	15 <sup>b</sup>	13.77	206.50
	Ties	2		
Total		29		
S <sub>1</sub> - S <sub>2</sub>	Negative Ranks	9 <sup>a</sup>	13.22	119.00
	Positive Ranks	20 <sup>b</sup>	15.80	316.00
	Ties	0 <sup>c</sup>		
Total		29		

a. E<sub>1</sub> < E<sub>2</sub>  
 b. E<sub>1</sub> > E<sub>2</sub>  
 c. E<sub>1</sub> = E<sub>2</sub>  
 d. S<sub>1</sub> < S<sub>2</sub>  
 e. S<sub>1</sub> > S<sub>2</sub>  
 f. S<sub>1</sub> = S<sub>2</sub>

Test Statistics <sup>a</sup>		E <sub>1</sub> - E <sub>2</sub>	S <sub>1</sub> - S <sub>2</sub>
Z		-2.130 <sup>b</sup>	-2.130 <sup>b</sup>
Asymp. Sig. (2-tailed)		.034	.033
a. Wilcoxon Signed Ranks Test			
b. Based on negative ranks.			

Table 2

Descriptive Statistics	N	Minimum		Maximum		Mean	Std. Deviation
		Statistic	Statistic	Statistic	Statistic		
PSS	16	18	26	21.63	2.187		
Pre							
PSQI	15	3	14	7.60	3.355		
Pre							
HPLP-II	16	2.02	3.87	2.6190	53521		
Pre							
PSS	15	16.00	27.00	20.6667	3.05817		
Post							
PSQI	13	2.00	10.00	5.8462	2.33973		
Post							
HPLP-II	16	1.06	3.69	2.7951	47934		
Post							
Valid N (listwise)	9						

Table 3

Ranks- Pre and Post Validated Tools Per Shift				
	Shift	N	Mean Rank	Sum of Ranks
PSS	Day shift	9	7.72	69.50
	night shift	7	9.50	66.50
	Total	16		
PSQI Global Score	Day shift	8	5.88	47.00
	night shift	7	10.43	73.00
	Total	15		
HPLP-II	Day shift	9	7.89	71.00
	night shift	7	9.29	65.00
	Total	16		
PSS	Day shift	8	9.44	75.50
	night shift	7	6.36	44.50
	Total	15		
PSQI	Day shift	7	7.64	53.50
	night shift	6	6.25	37.50
	Total	13		
HPLP-II	Day shift	8	9.13	73.00
	night shift	8	7.88	63.00
	Total	16		

Test Statistics<sup>a</sup>

	PSS pre	PSQI pre	HPLP-II pre	PSS post	PSQI post	HPLP-II post
Mann-Whitney U	24.500	11.000	24.000	16.500	16.500	27.000
Wilcoxon W	69.500	47.000	71.000	44.500	37.500	63.000
Z	-.754	-1.980	-.583	-1.337	-.657	-.525
Asymp. Sig. (2-tailed)	.451	.048	.560	.181	.511	.600
Exact Sig. [2*(1-tailed Sig.)]	.470 <sup>b</sup>	.054 <sup>b</sup>	.609 <sup>b</sup>	.189 <sup>b</sup>	.534 <sup>b</sup>	.643 <sup>b</sup>

a. Grouping Variable: Shift  
 b. Not corrected for ties.

Table 4

Ranks- PSQI Component Scores Per Shift				
	Shift	N	Mean Rank	Sum of Ranks
CS1	Day shift	8	6.06	48.50
	night shift	7	10.21	71.50
	Total	15		
CS2	Day shift	8	8.50	68.00
	night shift	7	7.43	52.00
	Total	15		
CS3	Day shift	8	6.94	55.50
	night shift	7	9.21	64.50
	Total	15		
CS4	Day shift	8	8.25	66.00
	night shift	7	7.71	54.00
	Total	15		
CS5	Day shift	8	6.44	51.50
	night shift	7	9.79	68.50
	Total	15		
CS6	Day shift	8	6.81	54.50
	night shift	7	9.36	65.50
	Total	15		
CS7	Day shift	8	6.81	54.50
	night shift	7	9.36	65.50
	Total	15		

Test Statistics<sup>a</sup>

	CS1	CS2	CS3	CS4	CS5	CS6	CS7
Mann-Whitney U	12.500	24.000	19.500	26.000	12.500	18.500	18.500
Wilcoxon W	48.500	52.000	55.500	54.000	51.500	54.500	54.500
Z	1.950	-.498	-1.179	-.253	-1.768	-1.247	-1.218
Asymp. Sig. (2-tailed)	.051	.618	.239	.800	.077	.212	.223
Exact Sig. [2*(1-tailed Sig.)]	.025 <sup>b</sup>	.694 <sup>b</sup>	.336 <sup>b</sup>	.867 <sup>b</sup>	.152 <sup>b</sup>	.281 <sup>b</sup>	.281 <sup>b</sup>

a. Grouping Variable: Shift  
 b. Not corrected for ties.

## Results

- As seen in table 1, A Wilcoxon signed rank test showed that there was a significant difference (Z= -2.130, p<0.05) between mean steps in week 1 and mean steps in week 4
- As seen in table 2, mean scores for each validated tool (pre and post competition)
- As seen in table 3, Night shift nurses scored poorly on the pre-PSS, pre-PSQI, and post HPLP-II
- A Mann-Whitney U test indicated that there was a significant difference in pre competition PSQI global scores between the night shift and the day shift: U(N<sub>nightshift</sub>=7, N<sub>dayshift</sub>=8)=12.500, z=-1.990, p=.054
- The night shift nurse scored poorly in the following components of the PSQI: Subjective sleep quality, sleep duration, sleep disturbances, use of sleeping medication, and daytime dysfunction
- As seen in table 4, Mann-Whitney U test indicated that there was a significant difference in the subjective sleep quality component: U(N<sub>nightshift</sub>=7, N<sub>dayshift</sub>=8)=11.000, z=-1.980, p=.047
- Night shift RNs poorly rate their sleep over the last month compared to the day shift RN
- Clinically significant difference in the sleep disturbances component: U(N<sub>nightshift</sub>=7, N<sub>dayshift</sub>=8)=15.500, z=-1.768, p=.077
- Night shift RN experienced more sleep disturbances (i.e. waking up to use the bathroom, waking up in the middle of the night)

## Summary

- Gamification and Fitness tracking can motivate nurses to engage in physical activity
- Encouraging the nurse to walk more could lead to more exercise
- Following the competition, there was improvement in perceived stress, sleep quality, and health promoting lifestyle behaviors
- Mean scores of all validated tools improved after competition, but nurses were still moderately stressed, not sleeping well, and not demonstrating many health promoting lifestyle behaviors
- Prior to the competition, the night nurse was more stressed and not sleeping well
- Night shift nurse is vulnerable as evidenced by significant differences in sleep quality compared to the day shift nurse.
- This framework is a good tool for the vulnerable nurse

## Discussion

### Physical activity

- Significant increase in mean steps when comparing week 4 to week 1
- Participants that walked more were more likely to be exercising
- Consistent with a studies by Patel and colleagues (2017) and Cadmus-Bertran and colleagues (2019): participants that used a fitness tracker demonstrated an overall increase in activity.

### Perceived stress, sleep quality, and health promoting lifestyle behaviors

- Mean scores were improved when comparing week 4 to week 1
- Scores demonstrate overall moderate stress, poor sleep quality, and poor health promoting lifestyle behaviors
- Consistent with ANA's findings in the HNH initial survey between 2013 and 2016 (ANA & ICG, 2016)
- Pre competition HPLP-II scores correlated with pre competition PSQI scores
- consistent with findings in literature that health promoting lifestyle behaviors are associated with sleep quality (Moudi et al., 2018; Muscogiuri et al., 2020)

### Qualitative Interview

- themes: motivation and awareness
- Quotes from the interviews:
  - "I joined a gym."
  - "Personal habit: turning minimal activities [into] exercise."
  - "A fitness tracker motivated me"
  - "I was more mindful of my steps"
  - "Being in a competition motivated me."
  - "I joined a gym."
  - "I was motivated when I saw my data compared week to week."

### Implications for Practice

- Novel framework that can motivate the nurse to move more
- Enrichment of current psychosocial health promotion programs
- There must be a balance of stress and rewards for nurses within the workplace (Press Ganey, 2018)
- Employers could provide bonuses for nurses who monitor their sleep, stress and lifestyle practices
- Directly impact quality of care in clinical setting (i.e., more frequent walking rounds)
- A healthy nurse is less likely to burnout and subsequently leave the profession
- This framework is a good tool to target vulnerable nurses.